Oral calculation methods use in preparation of creative students

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Abstract: *This article develops innovative methods of oral calculation and reveals the importance of examples and problem solving using these methods in training creatively gifted students.*

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1. Introduction

The greatness of a nation depends on its enlightened citizens. Tomorrow's citizens are being shaped in today's classrooms. Creatively gifted students are one of the nation's most valuable assets. In a developing country, there is a great need for creative students. [6. p.8]

Therefore, the study of the characteristics of creatively gifted students, its diagnosis, development of methods and identification of their abilities is one of the current problems of modern pedagogy. The problem of developing students' mathematical creativity requires special research due to their nature. "Creativity is a set of skills related to a person's creativity. Creativity includes a high level of sensitivity to problems, the ability to make quick decisions in problematic situations, intuition, foresight of results, imagination, research and reflection. [3. p. 72].

Research on the development of students' creative abilities shows that the concept of "mathematically creative student" is still not clearly defined in mathematics. By development of students 'creative abilities in mathematics lessons we mean the development of students' ability to quickly solve various standard and non-standard problems structured based on the content of mathematics curricula using the properties of mathematical concepts. One of the main tasks of training students with mathematical creative abilities is to form in these students thorough and robust computational skills. In this regard, the focus is primarily on verbal methods of calculation and, where possible, verbal calculations are required. When working with large numbers only, it is recommended to resort to written calculation methods only in cases where intermediate results are difficult to remember [5.p.102].

Convenient calculation methods allow you to find the result quickly, without performing an easy, overly complicated operation. To do this, the teacher himself must have a thorough mathematical preparation, be able to apply convenient methods and be well acquainted with their theoretical foundations.

2. Main part

In high school math, sets of natural, integer, rational, and real numbers are studied on the basis of concentric circles. In this case, the theory of natural numbers is the core of the remaining number theory. Just as arithmetic operations included in a set of natural numbers have properties, so do arithmetic operations included in sets of integers, rational numbers, and real numbers. It is also necessary to know in detail the natural numbers and the properties of arithmetic operations on these numbers when solving problems related to the performance of arithmetic operations on real numbers. It is obvious that a comprehensive teaching of the theory of natural numbers in mathematics lessons is one of the important links in the preparation of creative students.

In order to teach the theory of natural numbers to students with mathematical creativity, it is necessary to know the different ways of performing arithmetic operations on these numbers [5.p.103].

Using the following formula

$$\frac{a}{5^n} = \frac{a \cdot 2^n}{10^n} \quad (1)$$

when performing a division operation on numbers allows you to perform a division operation quickly and easily using the multiplication operation.

1- example. $\dfrac{185}{5} = \dfrac{185 \cdot 2}{10} = \dfrac{370}{10} = 37$

2-example. $\dfrac{185}{5^2} = \dfrac{185 \cdot 2^2}{5^2 \cdot 2^2} = \dfrac{185 \cdot 4}{10^2} = \dfrac{740}{100} = 7.4$

It can be seen from these examples that the use of formula (1) in solving examples and problems develops students 'verbal arithmetic skills.

In our article, we have tried to come up with different ways to calculate the product of natural numbers. As a result, we have come up with new ways to quickly and easily calculate the product of some non-negative integers.

These methods are reflected in the following theorem (we use the following definitions: $n \cdot 10 + p = \overline{np}$; $n \cdot 100 + m \cdot 10 + p = \overline{nmp}$; $(nm) \cdot 10 + p = \overline{nmp}$.

1 theorem. Let $\overline{np}$ and $\overline{mq}$ be arbitrary non-negative integers with the sum of the last digits 10, then the following

$$\overline{np} \cdot \overline{mq} = \overline{[n \cdot (m+1)](p \cdot q)} + \overline{[p \cdot (m-n)]0} \qquad (2)$$

is appropriate for the multiplication of these numbers.

Note:When $p=1$ and $q=9$, 09 should be written instead of $p \cdot q$ in formula (2). For example. $51 \cdot 79 = \overline{[5 \cdot (7+1)]09} + \overline{[1 \cdot (7-5)]0} = 4009 + 20 = 4029$.

The theorem proof.
$\overline{np} \cdot \overline{mq} = (10 \cdot n + p) \cdot (10 \cdot m + q) = 100 \cdot n \cdot m + 10 \cdot n \cdot q + 10 \cdot m \cdot p + p \cdot q = 100 \cdot n \cdot m + 10 \cdot n \cdot q + 10 \cdot n \cdot p +$

$10 \cdot m \cdot p - 10 \cdot n \cdot p + p \cdot q = 100 \cdot n \cdot m + 10 \cdot n \cdot (q+p) + p \cdot q + 10 \cdot p \cdot (m-n) = 100 \cdot n \cdot m + 10 \cdot n \cdot 10 + p \cdot q + p \cdot (m-n) \cdot 10 = n \cdot (m+1) \cdot 100 + p \cdot q + \overline{[p \cdot (m-n)]0} = \overline{[n \cdot (m+1)](p \cdot q)} + \overline{[p \cdot (m-n)]0}$

the theorem was proved.

1ˢᵗ result. Let n and $n+k$ be arbitrary non-negative integers, and let p and q be numbers whose sum is 10. In that case, the formula.

$$\overline{np} \cdot \overline{(n+k)q} = \overline{[n \cdot (n+k+1)](p \cdot q)} + \overline{(p \cdot k)0} \qquad (3)$$

is appropriate.

To prove this result it is enough to put m in theorem 1 instead of its eigenvalue $n+k$.

By substituting p and q in the formula (2) for their values satisfying the equation $p+q=10$, we obtain the following results.

2 Result. Let n and m be arbitrary non-negative integers. In that case

$$\overline{n1} \cdot \overline{m9} = \overline{[n \cdot (m+1)]09} + \overline{(m-n)0} \qquad (1.1)$$
$$\overline{n2} \cdot \overline{m8} = \overline{[n \cdot (m+1)]16} + \overline{[2 \cdot (m-n)]0} \quad (1.2)$$
$$\overline{n3} \cdot \overline{m7} = \overline{[n \cdot (m+1)]21} + \overline{[3 \cdot (m-n)]0} \quad (1.3)$$
$$\overline{n4} \cdot \overline{m6} = \overline{[n \cdot (m+1)]24} + \overline{[4 \cdot (m-n)]0} \quad (1.4)$$
$$\overline{n5} \cdot \overline{m5} = \overline{[n \cdot (m+1)]25} + \overline{[5 \cdot (m-n)]0} \quad (1.5)$$

formulas are appropriate.

These formulas take the following form at values of m equal to $n+k$.

$$\overline{n1} \cdot \overline{(n+k)9} = \overline{[n \cdot (n+k+1)]09} + \overline{k0} \qquad (1.1.1)$$
$$\overline{n2} \cdot \overline{(n+k)8} = \overline{[n \cdot (n+k+1)]16} + \overline{(2 \cdot k)0} \quad (1.2.1)$$
$$\overline{n3} \cdot \overline{(n+k)7} = \overline{[n \cdot (n+k+1)]21} + \overline{(3 \cdot k)0} \quad (1.3.1)$$
$$\overline{n4} \cdot \overline{(n+k)5} = \overline{[n \cdot (n+k+1)]24} + \overline{(4 \cdot k)0} \quad (1.4.1)$$
$$\overline{n5} \cdot \overline{(n+k)5} = \overline{[n \cdot (n+k+1)]25} + \overline{(5 \cdot k)0} \quad (1.5.1)$$

From each of these formulas derives practically convenient formulas with specific values of κ equal to 0,1,2,3,4,5.

From formula (1.1.1) the following formulas are derived:

1) $\overline{n1} \cdot \overline{n9} = \overline{[n \cdot (n+1)]09}$

2) $\overline{n1} \cdot \overline{(n+1)9} = \overline{[n \cdot (n+2)]19}$
3) $\overline{n1} \cdot \overline{(n+2)9} = \overline{[n \cdot (n+3)]29}$
4) $\overline{n1} \cdot \overline{(n+3)9} = \overline{[n \cdot (n+4)]39}$
5) $\overline{n1} \cdot \overline{(n+4)9} = \overline{[n \cdot (n+5)]49}$
6) $\overline{n1} \cdot \overline{(n+5)9} = \overline{[n \cdot (n+6)]59}$

Examples:

1) $81 \cdot 89 = \overline{[8 \cdot (8+1)]09} = 7209$

2) $91 \cdot 99 = \overline{[9 \cdot (9+1)]09} = 9019$

3) $51 \cdot 79 = \overline{[5 \cdot (5+3)]29} = 4029$

4) $51 \cdot 89 = \overline{[5 \cdot (5+4)]39} = 4539$

From (1.2.1) the following formulas are derived.

1) $\overline{n2} \cdot \overline{n8} = \overline{[n \cdot (n+1)]16}$
2) $\overline{n2} \cdot \overline{(n+1)8} = \overline{[n \cdot (n+2)]36}$

3) $\overline{n2 \cdot (n+2)8} = \overline{[n \cdot (n+3)]56}$

4) $\overline{n2 \cdot (n+3)8} = \overline{[n \cdot (n+3)]76}$

5) $\overline{n2 \cdot (n+4)8} = \overline{[n \cdot (n+5)]96}$

6) $\overline{n2 \cdot (n+5)8} = \overline{[n \cdot (n+6)+1]16}$

7) $\overline{n2 \cdot (n+6)8} = \overline{[n \cdot (n+7)+1]36}$

Examples :

1) $32 \cdot 58 = \overline{[3 \cdot 6]56} = 1856$

2) $32 \cdot 68 = \overline{[3 \cdot 7]76} = 2176$

3) $32 \cdot 78 = \overline{[3 \cdot 8]96} = 2496$

4) $32 \cdot 88 = \overline{[3 \cdot 9 + 1]16} = 2816$

(1.3.1) The following formulas are derived from the formula for the eigenvalues of κ :

1) $\overline{n3 \cdot n7} = \overline{[n \cdot (n+1)]21}$

2) $\overline{n3 \cdot (n+1)7} = \overline{[n \cdot (n+2)]51}$

3) $\overline{n3 \cdot (n+2)7} = \overline{[n \cdot (n+3)]81}$

4) $\overline{n3 \cdot (n+3)7} = \overline{[n \cdot (n+4)+1]11}$

5) $\overline{n3 \cdot (n+4)7} = \overline{[n \cdot (n+5)+1]41}$

6) $\overline{n3 \cdot (n+5)7} = \overline{[n \cdot (n+6)+1]71}$

Examples:

1) $33 \cdot 77 = \overline{[3 \cdot 8 + 1]41} = 2541$

2) $83 \cdot 127 = \overline{[8 \cdot 13 + 1]41} = 10541$

3) $103 \cdot 157 = \overline{[10 \cdot 16 + 1]71} = 16171$

4) $73 \cdot 127 = \overline{[7 \cdot 13 + 1]71} = 9271$

It can be seen from these examples that the use of the formulas generated above allows the multiplication and division operations to be performed orally in most cases. When students are taught the application of the above formulas to examples and problem solving in mathematics lessons, their mathematical creativity develops.

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